



INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
FOR WELKER® MINI FAST LOOP SAMPLER

MODEL

FLP

DRAWING NUMBERS

AD950AA

AD950CC

MANUAL NUMBER

IOM-258

REVISION

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SAFETY

IMPORTANT SAFETY INFORMATION READ ALL INSTRUCTIONS



NOTES emphasize information and/or provide additional information to assist the user.



CAUTION messages appear before procedures that could result in damage to equipment if not observed.



WARNING messages appear before procedures that could result in personal injury if not observed.

This manual is intended to be used as a basic installation, operation, and maintenance guide for the Welker® Mini Fast Loop Sampler. For further information and instructions, please refer to the Installation, Operation, and Maintenance (IOM) Manuals for each individual component. A list of relevant component IOM Manuals is provided in the Appendix of this manual.

The information in this manual has been carefully checked for accuracy and is intended to be used as a guide for the installation, operation, and maintenance of the Welker® equipment described in this manual. Correct installation, operation, and maintenance, however, are the responsibility of the end user. Welker® reserves the right to make changes to this manual and all products in order to improve performance and reliability.

BEFORE YOU BEGIN

Read these instructions completely and carefully.

IMPORTANT – Save these instructions for local inspectors' use.

IMPORTANT – Observe all governing codes and ordinances.

Note to Installer – Leave these instructions with the end user.

Note to End User – Keep these instructions for future reference.

Installation of this Mini Fast Loop Sampler is of a mechanical and electrical nature.

Proper installation is the responsibility of the installer. Product failure due to improper installation is not covered under the warranty.

If you received a damaged Mini Fast Loop Sampler, please contact a Welker® representative immediately.

Phone: 281.491.2331

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SECTION 1: PRODUCT INFORMATION

1.1 Introduction

We appreciate your business and your choice of Welker® products. The installation, operation, and maintenance liability for this equipment becomes that of the purchaser at the time of receipt. Reading the applicable *Installation, Operation, and Maintenance (IOM) Manuals* prior to installation and operation of this equipment is required for a full understanding of its application and performance prior to use.*

If you have any questions, please call Welker® at 1.281.491.2331.

**The following procedures have been written for use with standard Welker® parts and equipment. Assemblies that have been modified might have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker® *Mini Fast Loop Sampler*, Model FLP, is designed to generate an isokinetic fast loop from pipelines and capture accurate, representative liquid samples from a flowing stream. The FLP is compactly designed to mitigate vibration and stabilization issues. The FLP spot samples the liquid product directly from the fast loop. The sample then is pumped to an atmospheric liquid sample container such as the Welker® TCC Transportable Crude Oil Container. There, sample product accumulates until the operator has the desired number of samples. The atmospheric sample container then is labeled and taken to a laboratory for analysis.

The Mini Fast Loop Sampler consists of a pitot probe that has a large opening with a special patent-pending scoop-fin probe tip design, a Welker® Volume Regulator, and a solenoid. Sampling may be electrically, hydraulically, or pneumatically operated but is electronically controlled from a customer-provided Programmable Logic Controller (PLC) or other signal control system. Sampling may be timed or proportional-to-flow. When the solenoid is energized, the Volume Regulator is opened to the process, allowing pipeline pressure to fill the Volume Regulator with sample. When the solenoid is de-energized, the Volume Regulator is opened to the atmospheric sample container, allowing the Volume Regulator to empty.

The Mini Fast Loop Sampler is designed to be a maintenance-free, secure, and permanent installation.



For this manual, the term "Programmable Logic Controller" (PLC) will refer to the PLC, DCS, or other signal control used by the customer.

Welker® might custom design the Mini Fast Loop Sampler to suit the particular application and specifications of each customer.

1.3 Specifications



The specifications listed in this section are generalized for this equipment. Welker® can modify the equipment according to your company's needs. **Please note that the specifications may vary depending on the customization of your equipment.**

Table 1: Welker® Mini Fast Loop Sampler Specifications

Products Sampled	Crude Oil, Liquid Products Compatible With the Materials of Construction, Refined Hydrocarbons, and Water
Materials of Construction	Insertion Probe: 316/316L Stainless Steel, ASA/PLA Pipeline Connection: Carbon Steel or Stainless Steel
Maximum Allowable Operating Pressure	Automatic Insertion: 600 psig @ -40 °F to 140 °F (<i>41.36 barg @ -40 °C to 60 °C</i>) Fixed Insertion: 0 psig @ -40 °F to 140 °F (<i>0 barg @ -40 °C to 60 °C</i>) Pipeline Connection: 1480 psig @ -40 °F to 140 °F (<i>102.04 barg @ -40 °C to 60 °C</i>)
Minimum Process Pressure	30 psig (<i>2.06 barg</i>)
Process Viscosity Range	5–4000 cP
Process Media Operating Temperature	150 °F (<i>65 °C</i>)
Pipeline Connections	1" NPT 2" NPT 1" Flanged 2" Flanged
Sample Outlet Connection	¼" FNPT
Electrical Connection	½" FNPT
Insertion Length	12" 18" 24" 36"
Utility Requirements	Electrical: DC 6 V, DC 12 V, DC 24 V, AC 110–220 V
Sample Volume	0.5 cc–5 cc 2 cc–10 cc 10 cc–20 cc
Sample Grab Rate	Up to 30 samples/minute
Mounting	Horizontal or Vertical
Approximate Weight	25 lb (18" Model)
Approximate Dimensions	43 ³ / ₈ " x 2 ⁷ / ₈ " x 5 ⁷ / ₈ " (Length x Width x Height) (18" Model)
Features	3-Way Solenoid Valve Pitot Probe With Large, ASA/PLA Finned Tip Removable Automatic Insertion Device Screw-On Lock Cap Secure Lock Handle Volume Regulator
Industry Standards	UL CSA ATEX (Available Upon Request)
Options	Electrical Operation Hydraulic Operation Pneumatic Operation

1.4 Equipment Diagrams

Figure 1: Welker® Mini Fast Loop Sampler Diagram – Automatic Insertion Model – Fully Retracted

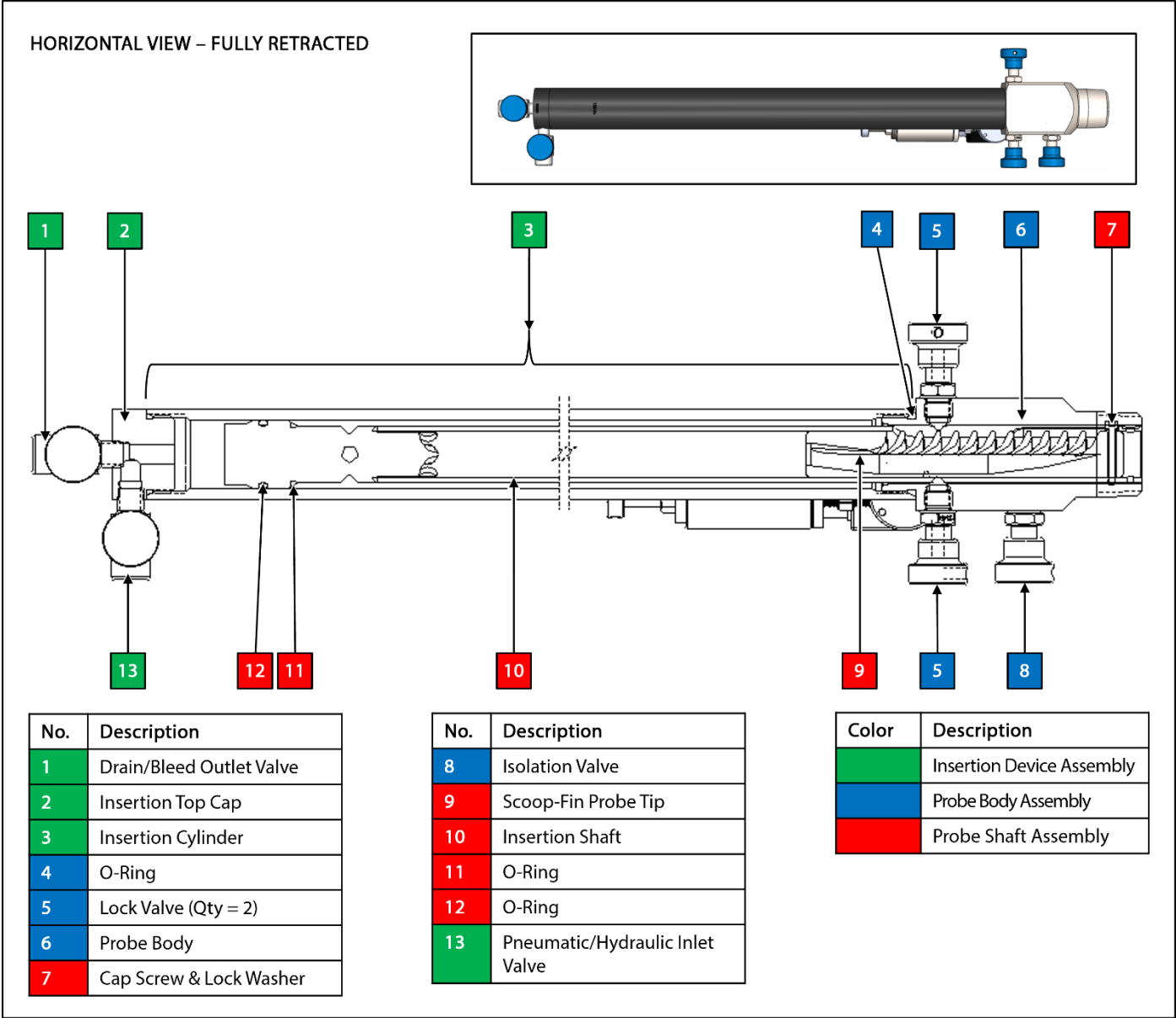


Figure 2: Welker® Mini Fast Loop Sampler Diagram – Automatic Insertion Model – Fully Inserted

No.	Description
1	Volume Regulator (See <i>Figure 8</i>)
2	Screw-On Lock Cap
3	Lock Valve (Qty = 2)
4	Insertion Length (See <i>Table 1, Specifications</i>)
5	Isolation Valve

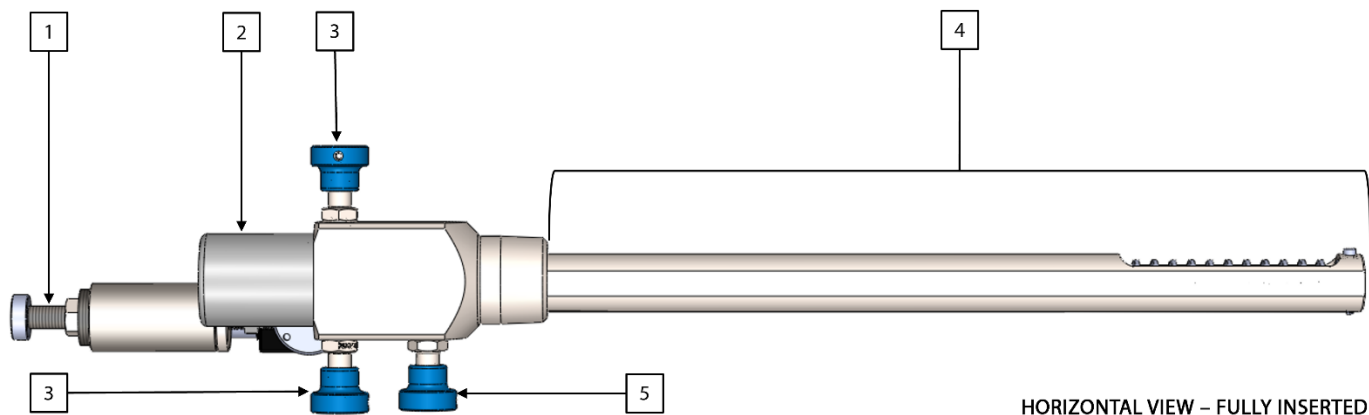
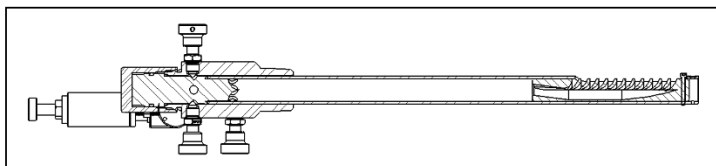
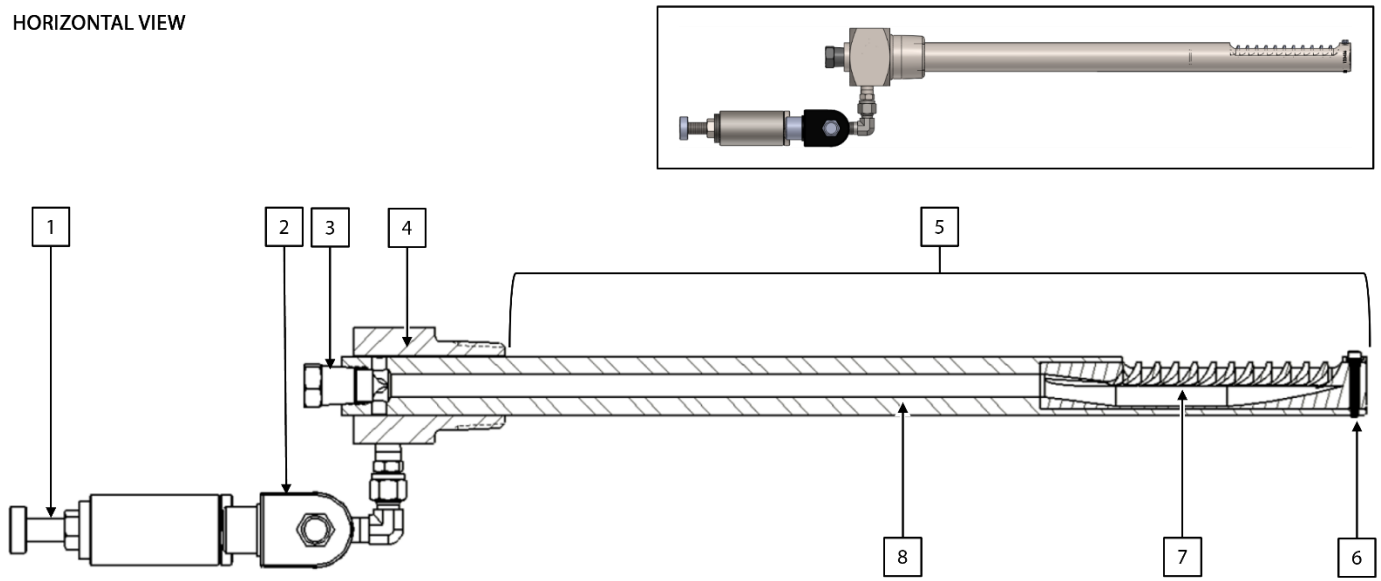


Figure 3: Welker® Mini Fast Loop Sampler Diagram – Fixed Insertion Model – Fully Inserted

HORIZONTAL VIEW



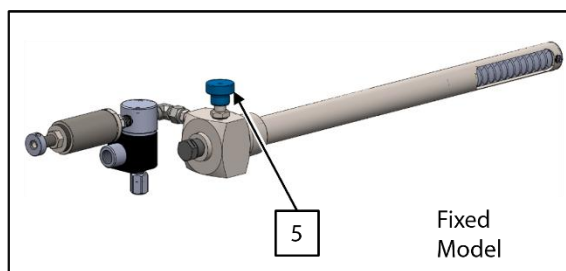
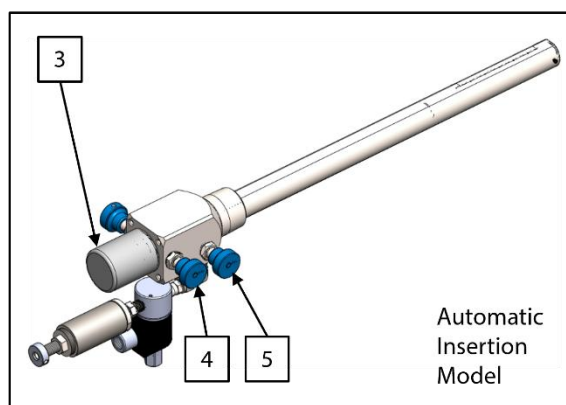
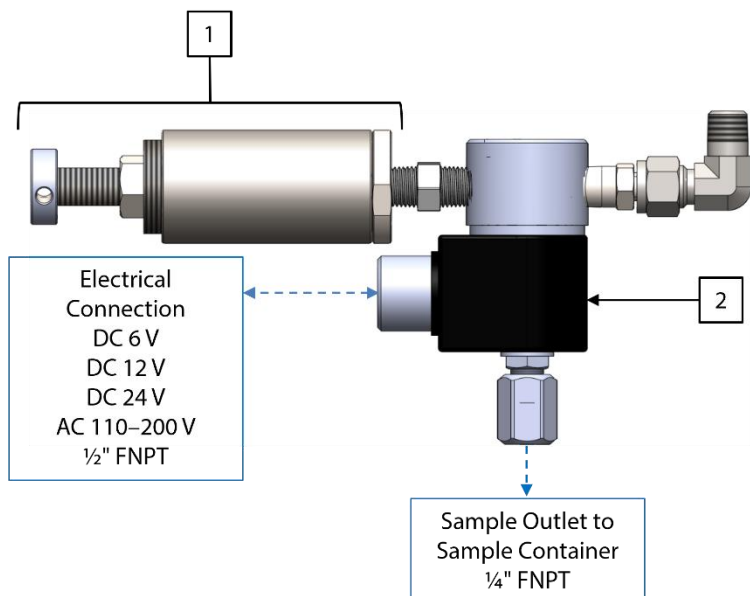
No.	Description
1	Volume Regulator (See Figure 8)
2	3-Way Solenoid Valve

No.	Description
3	Probe Base
4	Probe Body
5	Insertion Length

No.	Description
6	Cap Screw & Lock Washer
7	Scoop-Fin Probe Tip
8	Insertion Shaft

Figure 4: Welker® Mini Fast Loop Sampler Volume Regulator / Sample Outlet Assembly Diagram

No.	Description
1	Volume Regulator (See <i>Figure 8</i>)
2	3-Way Solenoid Valve
3	Screw-On Lock Cap
4	Lock Valve (Qty = 2)
5	Isolation Valve



INSETS: HORIZONTAL ORIENTATION – FULLY INSERTED



Sample Outlet MUST ALWAYS Be Pointed Downward, Regardless of Mini Fast Loop Sampler Orientation.

SECTION 2: INSTALLATION & OPERATION

2.1 Before You Begin



After unpacking the Welker® Mini Fast Loop Sampler, check it for compliance and any damage that might have occurred during shipment. Immediately contact a Welker® representative if you received a damaged Mini Fast Loop Sampler.



When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.

1. Welker® recommends that the unit be installed to the side of the pipe (*Figure 6*) and inserted into the center one-third ($\frac{1}{3}$) of the pipeline in a location where the product is well-mixed and will yield an accurate, representative sample.



The sample outlet **MUST ALWAYS** be pointed downward, regardless of whether the Mini Fast Loop Sampler is installed to the side of the pipe (horizontal) or to the top of the pipe (vertical) (see *Figure 5* and *Figure 6* for correct orientation of the sample outlet).

2. Locate the unit at least two to four pipe diameters downstream of an inline static mixer or other flow conditioning system.
3. Handle the unit with care.



Be certain to turn off ALL electrical power before accomplishing the installation of the Mini Fast Loop Sampler.



For the **FIXED** model of the Mini Fast Loop Sampler:
The pipeline **MUST BE** depressurized before either installing the unit or removing the unit.

4. Close the isolation valve and unscrew the lock valves (*Figure 1*) on the Mini Fast Loop Sampler.
5. For the **fixed model** of the Mini Fast Loop Sampler, it is necessary to depressurize the pipeline.
6. There is no need to depressurize the pipeline for the **automatic insertion model** because it uses external pneumatic or hydraulic pressure (e.g., hydraulic hand pump, nitrogen bottle) to push the insertion shaft into the pipeline. However, note that the maximum allowable operating pressure for the automatic insertion cylinder is 600 psig.
7. Before purchasing the Mini Fast Loop Sampler, the length the insertion shaft will need to travel inside the pipeline must be determined. See *Table 1, Specifications*, for insertion length options. The insertion shaft length is fixed at the length you specify, which means it cannot be adjusted. However, sample grab size is externally adjustable without probe retraction. Before acquiring a Mini Fast Loop Sampler, be sure to measure the distance the insertion shaft must be inserted from the top of the pipeline opening (*Figure 5* or *Figure 6*) to the desired insertion depth (recommended: the center one-third ($\frac{1}{3}$) of the pipeline). This measurement will be the shaft insertion length.
8. If you have the fixed model of the Mini Fast Loop Sampler, proceed to step 9. If you have an automatic-insertion Mini Fast Loop Sampler, proceed to step 14.

2.2 Installing the Unit

Figure 5: Positioning the Mini Fast Loop Sampler in the Pipeline – Horizontal Mounting

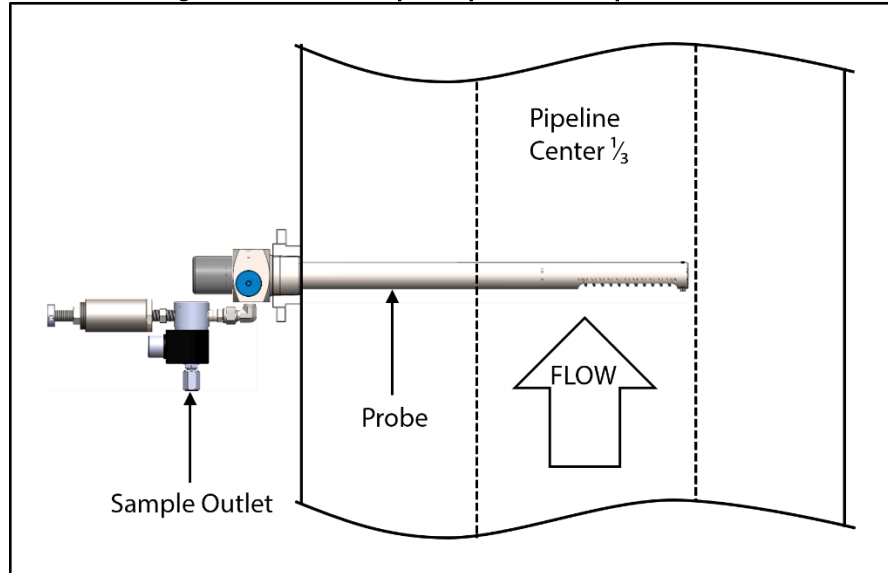
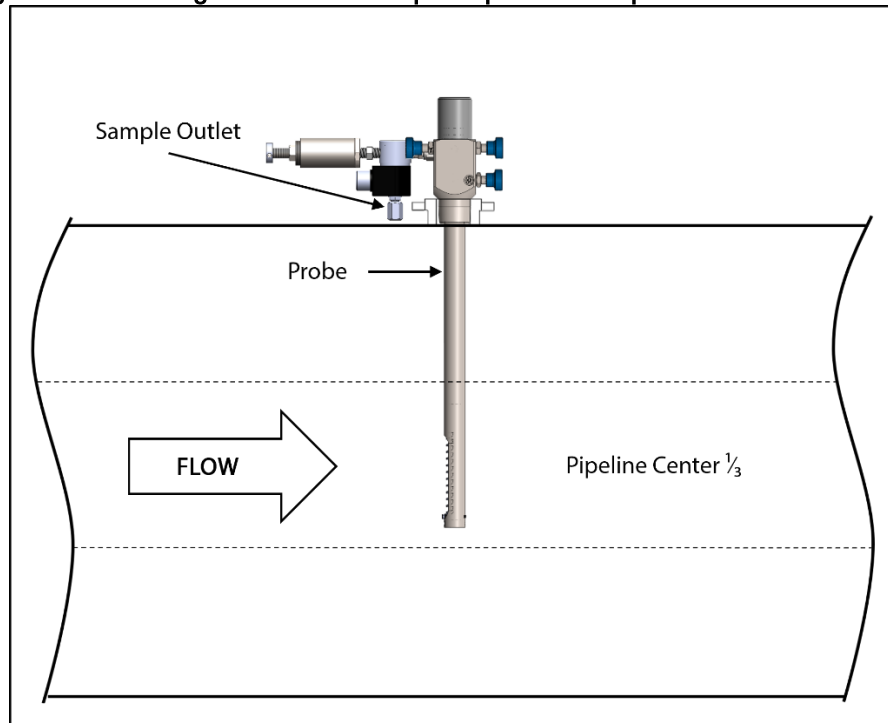


Figure 6: Positioning the Mini Fast Loop Sampler in the Pipeline – Vertical Mounting



Fixed Model Mini Fast Loop Sampler

9. The fixed model Mini Fast Loop Sampler insertion shaft cannot be retracted because it is welded to the probe body.



At pressures above 0 psig, the fixed model Mini Fast Loop Sampler cannot be safely inserted or retracted. To insert the fixed model Mini Fast Loop Sampler, the pipeline pressure will need to be reduced to 0 psig.

10. Place the fixed model Mini Fast Loop Sampler directly over the pipeline connection and insert into the pipeline.



The sample outlet **MUST ALWAYS** be pointed downward, regardless of whether the Mini Fast Loop Sampler is installed to the side of the pipe (horizontal) or to the top of the pipe (vertical) (see *Figure 5* and *Figure 6* for correct orientation of the sample outlet).

11. Determine the direction of product flow in the pipeline.
12. Secure the Mini Fast Loop Sampler to the pipeline. Be sure to do the following:
 - Rotate and orient the Mini Fast Loop Sampler insertion shaft to the pipeline so that the scoop-fin probe tip is open against the direction of product flow (*Figure 5* or *Figure 6*). This will allow the flowing stream to pass through the scoop-fin probe tip opening. As necessary, refer to the flow direction marking on the Mini Fast Loop Sampler probe body to ensure that the unit is installed correctly.
 - Orient the Volume Regulator/Sample Outlet assembly such that the sample outlet is pointing downward (see *Figure 5* and *Figure 6* for the correct orientation of the sample outlet).
13. Proceed to step 26.

Automatic Insertion of the Mini Fast Loop Sampler

14. Determine the direction of product flow in the pipeline.
15. Secure the Mini Fast Loop Sampler to the pipeline. Be sure to do the following:
 - Rotate and orient the Mini Fast Loop Sampler insertion shaft to the pipeline so that the scoop-fin probe tip is open against the direction of product flow (*Figure 5* or *Figure 6*). This will allow the flowing stream to pass through the scoop-fin probe tip opening. As necessary, refer to the flow direction marking on the Mini Fast Loop Sampler probe body to ensure that the unit is installed correctly.
 - Orient the Volume Regulator/Sample Outlet assembly such that the sample outlet is pointing downward (see *Figure 5* and *Figure 6* for the correct orientation of the sample outlet).
16. Connect the pneumatic/hydraulic inlet valve (*Figure 1*) on the automatic-insertion Mini Fast Loop Sampler to the external pneumatic or hydraulic pressure source.
17. Slowly open the pipeline isolation valve.
18. Slowly open the external pneumatic or hydraulic pressure source. The insertion shaft will begin to move through the pipeline opening until the shaft is fully inserted.
19. The Mini Fast Loop Sampler will only be fully inserted when the lock valves can be **fully** closed. This occurs when the lock holes are fully engaged. To achieve this, you will need to tighten the two lock valves **all the way in** to the holes until you cannot turn them anymore (*Figure 1*).
20. Disconnect the external pneumatic or hydraulic pressure source from the Mini Fast Loop Sampler pneumatic / hydraulic inlet valve. Air from the external pneumatic source that is trapped in the insertion cylinder will need to be vented to atmosphere. Oil from the external hydraulic source that is trapped in the insertion cylinder will need to be drained to a container.
21. Slowly open the drain/bleed outlet valve on the Mini Fast Loop Sampler (*Figure 1*). Allow all the trapped air to vent to atmosphere or allow all the trapped fluid to drain to the container.



DO NOT RELEASE the Mini Fast Loop Sampler insertion device assembly until the lock valves have been securely tightened. The two lock valves function as secure lock handles. When tightened, the lock valves engage with holes within the shaft, thereby ensuring the lock valves are securely in place.

22. When the automatic insertion device assembly (i.e., insertion cylinder) (*Figure 1*) is completely empty, unscrew the automatic insertion device assembly and set it aside in a safe location.
23. Wipe the exposed threads thoroughly with a clean cloth.
24. Take the screw-on lock cap and screw it securely in place at the top of the insertion shaft (*Figure 1* and *Figure 2*).
25. Continue to step 26.

Final Installation Steps

26. Using ¼" tubing, connect from the sample outlet (*Figure 4*) to an appropriate customer-supplied atmospheric liquid sample container, such as a Welker® TCC Transportable Crude Oil Container.



Customer-supplied ¼" tubing **MUST** slope downward from the Mini Fast Loop Sampler to the sample container.

27. Using the ½" power connection, connect an appropriate electrical supply to the 3-way solenoid valve electrical connection (*Figure 4*).



All electrical connections must meet local and national electric codes, and excessive weight added to the conduit run must be supported.

2.3 Operating the Unit

1. Ensure that all electrical power is turned OFF.
2. Ensure that the probe isolation valve (*Figure 4*) and the pipeline isolation valve are open.
3. Set the customer PLC timer or controller to energize the 3-way solenoid valve at the desired sampling actuation frequency based on the sampling equations provided (*Figure 7*).



For this manual, the term "Programmable Logic Controller" (PLC) refers to the PLC, DCS, or other signal control used by the customer.

Figure 7: Sampling Frequency Equations

Liquid Sampling, Proportional-to-Flow Collection	
Equation 1: Number of Samples Needed	
$\text{Number of Samples Needed to Fill to 80\%} = \frac{\text{Container Size (cc)} * 0.8}{\text{Bite Size (cc)}}$	
Equation 2: Proportional-to-Flow	
$\text{Volume of Flow Between Sample Grabs} = \frac{\text{Batch Size (Total Volume to Be Sampled)}}{\text{Number of Samples Needed (Eq. 1)}}$	
Use Equation 1 to determine the number of actuations needed. Use Equation 2 to determine how often (after what volume of flow) to take each sample.	
Liquid Sampling, Timed Collection	
Equation 1: Number of Samples Needed	
$\text{Number of Samples Needed to Fill to 80\%} = \frac{(\text{Container Size (cc)} * 0.8)}{\text{Bite Size (cc)}}$	
Equation 2: Timed Sampling	
$\text{Time Between Sample Grabs} = \frac{\text{Total Time in Sample Period}}{\text{Number of Samples Needed (Eq. 1)}}$	
Use Equation 1 to determine the number of actuations needed. Use Equation 2 to determine how often (after what amount of time) to take each sample.	



NEVER fill the sample collection container (e.g., Welker® Transportable Crude Oil Container) more than 80% of its capacity. Allow AT LEAST 20% room for product expansion should the container be exposed to increased temperatures. Program the customer PLC to alarm when the number of sample grabs has reached the sample collection container's 80% capacity.



Note that the sample volume of the Mini Fast Loop Sampler comes in three ranges—between 0.5 and 20 cc per actuation (*Table 1, Specifications*). Therefore, the number of samples needed to fill a sample container will vary according to the container's capacity at 80% and the size of the sample grab. For example, a Welker® Transportable Crude Oil Container could contain 3 US gallons @ 80%. There are 3,785 cc in 1 US gallon. At, for example, 5 cc per actuation, it would take 2,271 actuations for a Welker® TCC to reach the 80% maximum of 3 US gallons.



Note that the 0.8 in Equation 1 (*Figure 7*) represents the 80% volume limit for liquid.

4. Set the sample volume on the Welker® Volume Regulator. See *Section 2.4, Setting the Sample Volume*, for instructions on setting the sample volume.
5. Pressurize the pipeline.
6. Slowly open the customer-supplied sample outlet valve.
7. From the PLC, energize the 3-way solenoid valve to actuate the Volume Regulator at the set sampling frequency.

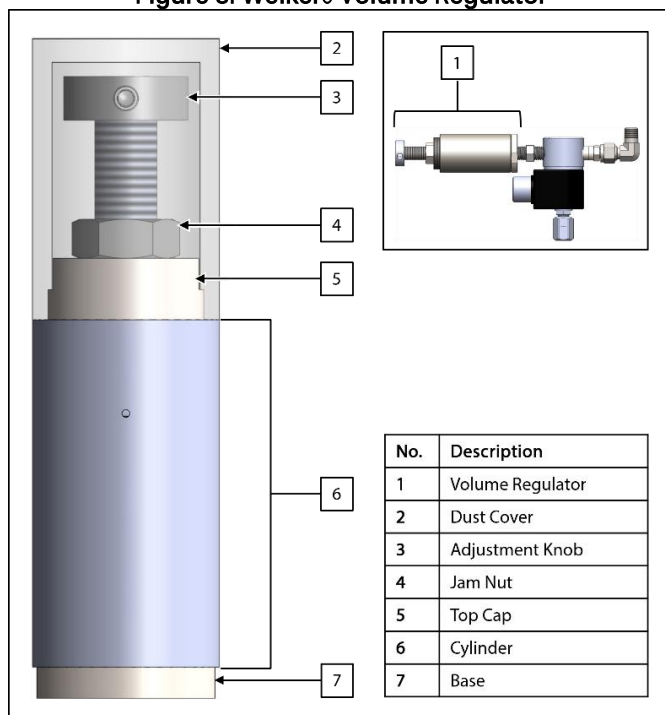


At start-up, several actuations might be required to displace trapped air and fill the insertion shaft with product before sample appears at the outlet port.

8. Collect a sample from the sample outlet to ensure that the sample volume collected is the same as the desired sample volume.
9. Continue sampling until the desired volume of sample has been obtained.
10. Should you desire to halt sampling, from the PLC, deenergize the 3-way solenoid valve to stop actuating the Volume Regulator. If you desire that sampling continue, allow the solenoid valve to continue actuating until a full sample batch is obtained.

2.4 Setting the Sample Volume

Figure 8: Welker® Volume Regulator



1. Remove the dust cover from the top of the Volume Regulator (*Figure 8*).
2. Loosen the jam nut on the adjustment screw (*Figure 8*).
3. Screw the adjustment knob clockwise all the way until it will not turn anymore. This sets the sample volume at 2 cc.
4. To increase the sample volume to the desired amount, screw the adjustment knob **counterclockwise** (*Figure 8*). To decrease the sample volume to the desired amount, screw the adjustment knob **clockwise** (*Figure 8*).



One full rotation of the adjustment knob is approximately 0.9 cc.

5. Welker® recommends verifying the sample volume prior to sampling. See *Section 2.5, Verifying the Sample Volume*, for instructions on verifying the sample volume.
6. When the desired sample volume has been attained, tighten the jam nut to secure the adjustment knob (*Figure 8*).
7. Return the dust cover to the Volume Regulator (*Figure 8*).

2.5 Verifying the Sample Volume

1. Ensure that the pipeline is pressurized.
2. As necessary, place a spot sample container (such as a beaker) under the sample outlet (*Figure 4*).
3. Decide how many actuations will be taken into the sample container to verify the sample volume.



Welker® recommends a minimum of ten (10) actuations to verify the sample volume.

4. From the customer PLC, energize the 3-way solenoid valve (*Figure 4*) to actuate the Volume Regulator.
5. Capture product in the sample container until the predetermined number of actuations has been taken.
6. When the predetermined number of actuations has been taken, deenergize the 3-way solenoid valve to stop actuating the Volume Regulator.
7. Disconnect the sample container from the sample outlet.
8. Calculate the sample volume by dividing the volume of product captured in the sample container by the number of actuations taken.
9. As necessary, adjust the sample volume on the Volume Regulator. See *Section 2.4, Setting the Sample Volume*, for instructions on setting the sample volume.

2.6 Retracting / Removing the Unit



At pressures above 0 psig, the fixed-insertion Mini Fast Loop Samplers cannot be safely inserted or retracted. Therefore, to retract the fixed-insertion Mini Fast Loop Sampler, the pipeline pressure needs to be reduced to 0 psig.



To avoid possible injury, DO NOT stand over the sampler during retraction / removal.



Be certain to turn off ALL electrical power before accomplishing the retraction and removal of the Mini Fast Loop Sampler.

1. Close ALL valves on the Mini Fast Loop Sampler, the insertion assembly, and on the complete sampling system of which the Mini Fast Loop Sampler is a part.
2. With fixed units, depressurize the pipeline.
3. Disconnect the sample container from the closed customer-supplied sample outlet valve.
4. For automatic-insertion units, unscrew the secure lock cap (*Figure 3*) and remove it. Set it aside in a safe location.
5. As necessary, place the insertion cylinder/automatic insertion device assembly where the lock cap was and screw it in until it is securely fastened. Ensure that the O-ring (#4 in *Figure 1*) in the probe body assembly is securely in place.
6. Slowly open the two (2) lock valves. Open the automatic insertion unit's drain valve (*Figure 1*) to vent all air in order to ensure a full retraction. If automatically retracted, allow the insertion shaft to retract from the pipeline and into the insertion cylinder. If you have a fixed-insertion unit, remove it by carefully pulling the insertion shaft out of the pipeline.
7. When the automatic insertion unit is fully retracted, securely tighten the two (2) lock valves.
8. If complete removal of the Mini Fast Loop Sampler is desired, close the pipeline isolation valve and depressurize the pipeline. The unit is now ready to be removed from the pipeline for relocation.

SECTION 3: MAINTENANCE

3.1 Maintenance

1. The Mini Fast Loop Sampler was designed to be a secure, permanent installation that requires no maintenance.
2. Should the Mini Fast Loop Sampler need to be retracted and removed from the pipeline for deployment to another location, see *Section 2.6, Retracting / Removing the Unit*.
3. For maintenance on Mini Fast Loop Sampler component products and other components of a complete sampling system, refer to the *Appendix* to this manual and/or to specific manufacturers' *Installation, Operation, and Maintenance (IOM) Manual(s)*. For example, for Welker® NV-1 Instrument Valve maintenance, refer to *IOM-270*. Or for crude oil collection head assembly maintenance, refer to *IOM-068*.

APPENDIX: REFERENCED OR ATTACHED DOCUMENTS

Welker® *Installation, Operation, and Maintenance (IOM) Manuals* suggested for reference or for use with this unit:

- IOM-011: Welker® CP-2G Constant Pressure Cylinder With Tracker Tube (Non-Mixer)
- IOM-012: Welker® CP-2GHP Constant Pressure Cylinder (High-Pressure) With Tracker Tube (Non-Mixer)
- IOM-013: Welker® CP-2GM Constant Pressure Cylinder With Tracker Tube and Gravity Mixer
- IOM-014: Welker® CP-2GMHP Constant Pressure Cylinder (High-Pressure) With Tracker Tube and Gravity Mixer
- IOM-063: Welker® CP-2SI Constant Pressure Cylinder With Solid Indicator, Syringe T-Handle, or Vortex Mixer
- IOM-068: Welker® AWL-3 Crude Oil Collection Assembly
- IOM-115: Welker® CP-2MHP Constant Pressure Cylinder (High Pressure) With Solid Indicator, T-Handle, and Vortex Mixer
- IOM-117: Welker® TCC-1 Transportable Crude Oil Container
- IOM-131: Welker® LS-14 Constant Pressure Sample Container
- IOM-186: Welker® TCC Optimum™ Transportable Crude Oil Container
- IOM-197: Welker® TCC-5 Transportable Crude Oil Container
- IOM-206: Welker® TCC-2 Transportable Crude Oil Container
- IOM-207: Welker® TCC-3 Transportable Crude Oil Container
- IOM-208: Welker® TCC-10 Transportable Crude Oil Container
- IOM-270: Welker® NV-1 Instrument Valve
- IOM-271: Welker® NV-2 Instrument Valve

Other *Installation, Operation, and Maintenance (IOM) Manuals* suggested for reference or for use with this unit:

- Parker Skinner™ 71313, 71315, 71335, 71385, 71395, 7131V, and 7133V 3-Way Solenoid Valve (Welker® IOM-V016)
- Parker Skinner™ X5R71900DC0A4Y 3-Way Solenoid Valve (Welker® IOM-V291)
- Parker Skinner™ 3-Way Solenoid Valve (Welker® IOM-V424)

Welker® drawings and schematics suggested for reference or for use with this unit:

- Assembly Drawing: AD950AA (Welker® Mini Fast Loop Sampler – Automatic Insertion)
- Assembly Drawing: AD950CC (Welker® Mini Fast Loop Sampler – Fixed Insertion)

NOTES

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